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Temporal Changes of Striatal Dopamine Release During and After a Video Game with a Monetary Reward: A PET Study with [¹¹C]Raclopride Continuous Infusion

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Purpose: In an attempt to understand the neurochemical changes associated with rewarded motor learning in human brain, we investigated the temporal changes of striatal dopamine (DA) release during and after a goal-directed psychomotor task (a video game) with a monetary incentive using [¹¹C]raclopride PET. **Methods:** Seven healthy, right-handed, nonsmokers were studied with PET for 120 min (50 min resting followed by 40 min video game and another 30 min resting) while receiving a bolus plus constant infusion of the DA D2 receptor radioligand [¹¹C]raclopride. During the video game (from 50 to 90 min postinjection), subjects played Tetris, which involved learning of joystick movement to fit falling jigsaw blocks, and periodically rewarded with unpredictable amount monetary incentives for improved performance. Striatal V3", calculated as striatal-cerebellar/cerebellar activity ratio, was measured under equilibrium condition, at baseline and during and after the video game. **Results:** Striatal V3" was significantly reduced during the video game compared with baseline levels, indicating increased DA release in this region (caudate, -15±6%; putamen, -30±10%). During the 30 min after the game ended, striatal [¹¹C]raclopride binding was gradually increased and the V3" approached baseline levels. There was a significant correlation between the reduction in striatal V3" and the task performance during the video game. **Conclusion:** These results demonstrate DA release in the human striatum during a psychomotor task with a monetary reward and to our knowledge for the first time a gradual DA restoration to baseline levels following the offset of stimulation. They also illustrate that acute fluctuations of synaptic DA can be measured in vivo using [¹¹C]raclopride PET.

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Limited role of I-123 IPT SPECT in differentiating essential tremor from early stage of Parkinson's disease

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Objectives: The study was to assess clinically applicable cut-off value in differential diagnosis among early stage of Parkinson's disease(PD) and essential tremor(ET) and normal control(NL) groups on I-123 IPT SPECT using dual head gamma camera both quantitatively and qualitatively. **Methods:** 50 NL (mean age 27.9), 20 early PD patients (mean age 58.2), 30 advanced PD patients (mean age 63.1) and 20 ET patients (mean age 39.9) were included and performed brain SPECT 2 hours after administration of I-123 IPT using dual head gamma camera. Reconstructed SPECT data were assessed for specific/nonspecific binding ratio of striatum using (RBG-OCC/OCC, LBG-OCC/OCC) ratio. **Results:** RBG-OCC/OCC and LBG-OCC/OCC ratio was decreased with increasing grade of H-Y stage in PD. Mean value of specific/nonspecific binding ratio was significantly different between advanced PD group and NL group. However, significant overlap of striatal specific/nonspecific bonding ratio were observed between early PD group and ET group. Suggested cut-off value of striatal binding ratio which can diagnose PD would be 2.1. **Conclusion:** Although I-123 IPT SPECT may be a useful method for the diagnosis of advanced PD and objective evaluation of progress of clinical stages, care should be made in the differential diagnosis of subclinical and early stage of PD and other motor disturbances mimicking PD such as ET in view of significant overlap in striatal I-123 IPT specific/nonspecific binding ratio.